Section 1.2 & 1.3
Order and Absolute Value

Statements involving the symbols $>, <, \geq, \leq, \neq, \not<$ are called inequalities.

The inequality $a<b<c$ says that b is in between a and c.

CAUTION

When writing "between" statements make sure that the inequality symbols point in the same direction, toward the smaller number.

TRUE STATEMENTS

$-2 < 8 < 10$

$-7 > -10 > -15$

FALSE STATEMENTS

$5 > 3 < 9$

$-2 < 0 > -7$

NOTE: It is best to write between statements with the smallest number on the left, which is the same way they read on the number line.

PROPERTIES OF ORDER

For all real numbers a, b, and c:

TRANSITIVE PROPERTY of order

If $a < b$ and $b < c$, then $a < c$.

ADDITION PROPERTY

If $a < b$, then $a + c < b + c$.

MULTIPLICATION PROPERTY

If $a < b$, and if $c > 0$, then $ac < bc$.

If $a < b$, and if $c < 0$, then $ac > bc$.

ABSOLUTE VALUE

For all real numbers a, $|a| = \begin{cases} a \text{ if } a \geq 0 \\ -a \text{ if } a < 0. \end{cases}$

$|-5| = 5$

PROPERTIES OF ABSOLUTE VALUE

$$|a| \geq 0$$

$$|-a| = |a|$$

MORE PROPERTIES OF ABSOLUTE VALUE

$$|a| \cdot |b| = |ab|$$

$$\left|\frac{a}{b}\right| = \frac{|a|}{|b|} \quad (b \neq 0)$$

ONE MORE PROPERTY OF ABSOLUTE VALUE

$$|a+b| \leq |a| + |b|$$

(called the triangle inequality)

Write the following numbers in numerical order from least to greatest.

$\sqrt{4}$ $\sqrt{5}$ $\sqrt{9}$

2 2.1 3

$-2,\ \frac{1}{7},\ -\frac{2}{7},\ \sqrt{10},\ \sqrt{20},\ 4.1,\ 3,\ -\sqrt{5}$

$\sqrt{9}$ $\sqrt{10}$ $\sqrt{16}$

3 $\approx$ 3.1 4

$-\sqrt{5}, -2, -\frac{2}{7}, \frac{1}{7}, 3, \sqrt{10}, 4.1, \sqrt{20}$

$\sqrt{16}$ $\sqrt{20}$ $\sqrt{25}$

4 4.4 5

Multiply the following inequalities by the given number to get a new inequality.

1) $-4 < -9, \quad -3$

$12 > 27$

2) $90 \geq 75, \quad \frac{1}{15}$

$6 \geq 5$

Evaluate. Let $x = 3$, $y = -4$

1) $|3x - y|$

$|3(3) - (-4)|$

$|9 + 4|$

$|13|$

13

2) $\dfrac{|-x| + |2y|}{x + y}$

$\dfrac{|-3| + |2(-4)|}{3 + -4}$

$\dfrac{3 + 8}{-1} = \dfrac{11}{-1} = -11$

Write each expression without absolute value bars.

1) $\left|-\sqrt{3}+2\right|$

$-\sqrt{3}+2$

$2-\sqrt{3}$

2) $\left|-\sqrt{3}+1\right|$

$-(-\sqrt{3}+1)$

$\sqrt{3}-1$

3) $\left|-\sqrt{3}-2\right|$

$-(-\sqrt{3}-2)$

$\sqrt{3}+2$

Write each expression without absolute value bars.

1) $|-\pi + 4|$

$-\pi + 4$

2) $|\pi - 4|$

$-(\pi - 4)$

$-\pi + 4$

$4 - \pi$

3) $|x - 4|$ if x<4

$-(x - 4)$

$-x + 4$

$4 - x$

Assuming all variables represent real numbers, justify each statement by giving the correct property from this section.

1) If $-3y > -42$, then $y < 14$

Mult. prop. of order

2) $|y + x| \geq |y| + |x|$

Triangle Ineq.

Use the concepts of this section to determine what signs on the values of x and y would make the statement true.

1) $xy < 0$

$x < 0$ and $y > 0$

OR

$x > 0$ and $y < 0$

2) $\frac{x}{y^2} < 0$

$x < 0$

In class tomorrow:

Day 2 and 3 assignments: p 23: 1-28 (all), p 23-5: 29-48, 60-64 (all), properties worksheet (do last)